

Memorandum

Date: June 20, 2002

To: Mr. Banky Curtis, Regional Manager
California Department of Fish and Game
Sacramento Valley-Central Sierra Region
1701 Nimbus Road
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From: Ivan Paulsen *ALP*
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Re: Lake Davis Detonation Cord Phase I Project Results

Introduction

The Department is planning to use detonation cord as a technique to remove northern pike from Lake Davis. This is one of the methods recommended in *Managing Northern Pike: a Plan for Y2000*, a plan developed by the Department in cooperation with the local community following the rediscovery of pike in Lake Davis in 1999. The use of detonation cord alone will not rid Lake Davis of northern pike. It is one of several tactics being used to keep the pike population suppressed until an eradication method is developed.

The two-phase project consists of an initial 1-acre test (Phase I) and then larger scale implementation (Phase II) with shots up to 20-acres each for a maximum of 300 acres over an additional 2-year period. A Mitigated Negative Declaration, under the California Environmental Quality Act, was prepared for the project and approved by the Department on February 28, 2002.

Phase I of the project was performed on April 24, 2002 at the north end of the reservoir in Mosquito Slough (Figure 1). The purpose of Phase I was to determine the effective kill radius of the cord on northern pike in the Lake Davis environment, to evaluate water quality effects, noise and ground motion, and to provide the public and the media with an opportunity to observe and learn about the technique. Although Phase I was originally designed to target pike near the time of spawning, the Department decided to focus Phase I on data collection and public information rather than targeting large quantities of free-swimming

pike. It is hoped that the information gathered and education of those involved will help Phase II run smoothly.

Cord Layout and Initiation

Robert Snyder, Fisheries Habitat Supervisor, Central Coast Region, supervised the blasting operation. About 895 feet of 50-grain Primacord detonation cord was laid out by a team of divers in a rectangle about 400 feet by 40 feet across the mouth of Mosquito Slough. The layout was oriented with the two longest segments placed parallel to each other on a bearing of S20W/N20E, and separated by about 40 feet. The cord was anchored on steel posts placed the previous day, and was suspended about midway in the water column. About five feet of the cord emerged above water and was wrapped around the easternmost steel post. Four electric blasting caps, two at each end of the detonation cord, were used to ignite the cord. Water depth in the project area ranged from three to ten feet in an area with a soft and silty substrate. Reservoir level was 5,766.00 feet above mean sea level (eight feet below spill). Surface water temperature was 52 degrees Fahrenheit. The weather was clear and calm.

At about 1300 hours, the five-minute warning was given. The shot was initiated at about 1305 hours, and all of the cord was successfully detonated. The shot sent water up into the air about five to twelve feet directly above the cord (Figure 2) and created a quick, loud booming noise.

Fish Mortality

Lori Powers and Mike Morrison, Fisheries Biologists, Sacramento Valley and Central Sierra Region, Portola Field Office, monitored fish mortality. Details of the monitoring efforts, including live car construction and specific fish size and placement, are in a report on file at the Portola Field Office. The following summarizes that report.

Twelve 30" long 12" diameter cylindrical mesh holding cars were placed at set distances along a transect perpendicular to the long side of the rectangle of cord (Figure 3). Cars were placed at 5.75-foot intervals in water depths ranging from 3.5 to 10.0 feet. The cars were placed between 2.75 and 3.5 feet from the bottom.

A total of 24 northern pike, seven golden shiners and three pumpkinseed sunfish were placed in the live cars. Pike ranged in size from 7-24". A control car containing two northern pike and one golden shiner was placed in a cove south of the project, beyond the range of any detonation effects. One of the live cars was placed off the transect in a near-shore area 23 feet from the cord in order to attach a hydrophone for underwater acoustic testing.

22 of the northern pike were killed by the blast. All pike were killed up to and at 23 feet from the cord. One of the two pike placed at 28.75 feet and one of the three pike placed at 34.5 feet survived. The most common injury observed in killed fish was a ruptured air bladder. Other injuries included ruptured kidneys, internal bleeding, torn internal membranes, broken rib bones, and external bruising.

Two rainbow trout were collected at the surface of the project area following the blast. Diving teams searched the bottom of the project area and did not find any further mortalities.

Water Quality

Janna Herren, Environmental Scientist in the Sacramento Valley and Central Sierra Region, supervised the water quality monitoring, operating under Waste Discharge Requirements (Order Number R5-2002-0040) of the Central Valley Regional Water Quality Control Board (Board). A detailed water quality monitoring report was submitted to the Board, Plumas County, and the Department of Health Services on June 3, 2002.

Water was monitored for volatile organics, semi-volatile organics, cyanide, pentaerythritol tetranitrate (PETN), ammonia, and turbidity. Samples were taken at two locations within the area of the detonation cord rectangle about 30 minutes following the test shot (Figure 4). Background samples were collected before the shot. Monitoring for biological oxygen demand and dissolved oxygen was waived after it was determined that there were no fish carcasses remaining in the water.

Volatile organics, cyanide, and PETN were not detected in any of the samples. Ammonia was detected at 0.10 mg/L in one of the four samples taken. The water quality criterion for ammonia is 3.28 mg/l.¹

Semivolatile organic chemicals of the phthalate family were found in both background samples and two of the three samples taken within the project area. The quantities found are above the reporting limits and criteria established by the EPA for these chemicals (Table 1). The background and equipment blank concentrations indicate that the compounds were either contaminants from the sampling device or were in the reservoir before the detonation project. Phthalates are frequently detected in surface water samples because of their common use in plastic products and use as a plasticizer. Phthalates may have been introduced to the samples by plastic components of the new Beta Horizontal sampler. Due to the great dilution of detonation cord byproducts, it is highly unlikely that the phthalate levels in the post-detonation samples are due to

¹ The Criterion Continuous Concentration for ammonia in fresh water, with salmonids present and at pH 6.8, as established by the Ambient Water Quality Criteria for Ammonia (U.S. EPA, 1998 Update) is 3.28 mg/l NH₃-N.

detonation cord. The DFG recommends that semi-volatile organics be re-analyzed with the next detonation.

Table 1. Quantities of phthalates detected in background and post-detonation samples.

	bis(2-ethylhexyl) phthalate	diethyl phthalate	Dimethyl phthalate
Background (LKDV1)	3 ug/L	5 ug/L	4 ug/L
After detonation, location 1 (LKDV2)	none detected	9 ug/L	5ug/L
After detonation, location 2 (LKDV3)	11 ug/L	None detected	none detected
Criteria established by Environmental Protection Agency	1.8 ug/L	3 ug/L	3 ug/L

Turbidity was monitored about 300 feet from the project area in the direction of Grizzly Valley Dam (Figure 4). Turbidity measurements after detonation were within 1 Nephelometric Turbidity Unit (NTU) of background levels, meeting criteria established by the Board. Small mats of floating debris from the polypropylene and cellulose casing were observed and removed using dip nets as prescribed by the contingency plan for solids cleanup.

Wildlife

Jim Lidberg, District Wildlife Biologist and Lori Powers monitored bird activity at the project area prior to and during the detonation. An estimated three individual osprey, six pelicans and two loons foraged in the area prior to the test. As the five-minute warning was signaled, one pelican and two loons were within 100 yards of the project area. Several attempts were made to scare them away with warning shots using hazing loads, but failed. When the shot was fired, it was estimated that the loons were at 30 yards and 50 yards from the cord. The loon furthest from the cord dived and was underwater at the time of the blast. The pelican was estimated to be between 20 and 100 yards away.

Both loons appeared unaffected by the blast and continued to forage. The pelican startled and ruffled its feathers in response to the blast, but did not appear harmed and continued to forage.

An occupied bald eagle nest site 1.4 miles from the project area was monitored during the morning of the project. An adult was present at the nest in incubating posture at the time of the shot. When the detonation occurred, the bird slowly turned its head in the direction of the noise, but otherwise showed no sign of disturbance.

Noise

Julie Cunningham, Environmental Scientist, Sacramento Valley and Central Sierra Region, Portola Field Office, coordinated noise monitoring efforts. Two locations were monitored in an attempt to record peak decibel levels using Larson-Davis DSP80 Type I noise meters set on tripods about four feet from the ground with the microphone pointed in the direction of the project. One monitor was about 150 feet from the nearest portion of the detonation cord, and a second monitor was set up about 1.4 miles west of the project site near an occupied bald eagle nest. Peak dbC was the target parameter.

The peak noise level recorded at the project site location was 140 dbC, the maximum level recordable by the instrument, so the peak was probably greater than this. The peak noise level for the shots used to scare the birds was 130.1 dbC. At the remote site, the peak dbC for the test shot was not recorded, due to a problem with the "reset" button on the meter. The monitors observed, however, that the detonation shot did not sound any louder than the shots used to scare the birds. The monitors observed that the noises were not as loud as some of the background noises they recorded, such as helicopters flying in the vicinity.

Invertebrates

Lori Powers examined invertebrate samples before and after the test shot in order to make a general assessment of the project effects on aquatic invertebrates. Samples of the water and benthos were gathered one day prior to and on the morning after the test shot. The need to examine fresh samples (with live, moving invertebrates), as well as the appearance of the detritus (with plant and animal parts in varying stages of decomposition) made it difficult to determine if there were effects on the invertebrates, with the exception of daphnia. In the post-treatment sample, nearly all of the daphnia were dead. Several hundred daphnia were observed. The bulbous bodies of all but two daphnia appeared to be freshly-ruptured. This differed from the pretreatment sample in which nearly all daphnia were alive.

Based on this preliminary assessment, DFG will design and conduct a study to monitor the effects of the use of detonation cord on benthic and planktonic invertebrates during future use of the method on larger plots.

Ground Motion Monitoring

The California Department of Water Resources (DWR) monitored ground motion in four locations as described in a DWR memo from Frank R. Glick, Chief, Project Geology Section, to Teresa Sutliff, Chief, Civil Maintenance Branch, dated May 1, 2002. The following summarizes that memorandum.

The first station used a new Blastmate III seismograph/noise monitor set up about 235 feet from the blast. The second site was an instrument set up near the left abutment of Grizzly Valley Dam. The third site was the permanent strong motion accelograph located in the outlet control building on the upstream side of the dam near the left abutment. The fourth site was a DWR instrument on Beckwourth Mountain, about 12.7 miles southeast of the project site.

Only the monitor set up at the project site detected any ground motion. However, the movement was so small that it would not be noticeable to a human. The conservative DWR standard threshold for acceptable ground motion without damage to specific structures is 2.0 inches per second. This standard is about ten times higher than the highest peak particle velocity of 0.2128 inches per second measured by the seismograph at the project site.

Security and safety

Patrol Lieutenant Gayland Taylor coordinated project security in cooperation with U.S. Forest Service law enforcement officers and the California Highway Patrol. Road closures were established and monitored, and wardens were stationed in boats, vehicles and on foot at key locations near the project site.

Robert Snyder coordinated project safety. All personnel were briefed on safety and emergency procedures at a mandatory meeting on the day prior to the project. A list of all personnel with emergency contacts was distributed.

Public Viewing and Media Relations

Steve Martarano, Information Officer, Office of Conservation Education, and Ivan Paulsen, Senior Fisheries Biologist, coordinated public viewing and media relations. A public viewing area was established with cones and flagging at Fairview point, about 2000 feet south of the project site (Figure 1). Informational brochures on the project were handed out, and DFG personnel were on hand to discuss the project with interested people.

The viewing area was intended to be at one location, but people were present all along the road to this area, so some people may not have had access to the information provided. About 40 people (excluding members of the press) were at the public viewing area.

The media staging area was originally planned to be at Fairview Point. A pontoon boat was available to shuttle groups of media personnel from the public viewing area out onto the reservoir for a closer look at the project layout prior to the blast. However, media arrived sooner than the time published in the press release, many were present at the staging area at Mosquito Slough prior to project implementation. By 1130, however, many members of the media had

moved to the Fairview Point area for the boat tour. At least 18 media personnel were present, representing several television stations and newspapers.

Discussion

Information gathered during the Phase I test shot will be used to more effectively implement Phase II. It is recommended that blocking nets be installed prior to the layout of the projects under Phase II. If the detonation cord is positioned in parallel lines, 50-grain detonation cord should be laid out in rows about 40-45' apart.

For future shots, continued attempts should be made to monitor and frighten any birds or wildlife in the vicinity. Experiments should be conducted with other noise makers, such as "acoustic scarecrows" to see if they would be any more effective than the methods used.

The water quality laboratory and monitoring results demonstrate that the detonation project had minimal or no impact to water quality at Lake Davis. Due to the likely phthalate contamination by the sampler, the DFG recommends analysis of those compounds in a future detonation. The DFG is requesting, at the discretion of the Central Valley Regional Water Quality Control Board, that analysis demonstrating compliance with Basin Plan criteria in Phase I, including volatile organics, ammonia, and cyanide be waived in Phase II. The DFG is also requesting a continued waiver or reduction of biological oxygen demand, dissolved oxygen, and turbidity monitoring requirements, particularly where few fish carcasses are present or carcasses are removed by divers and netting crews.

For future shots, the DWR recommends that ground movement be monitored at the project site only.

Monitoring of bald eagles will continue as per DFG's existing agreement with the U.S. Fish and Wildlife Service. For shots 1.4 miles and greater from any known nests, it should not be necessary to monitor noise near the nest site. However, if shots are closer than 1.4 miles, noise will be monitored.

It worked well to have a central staging area for media. If media or the general public is interested in observing future shots, a gathering area should be designated, with personnel present who can describe the project to those interested.

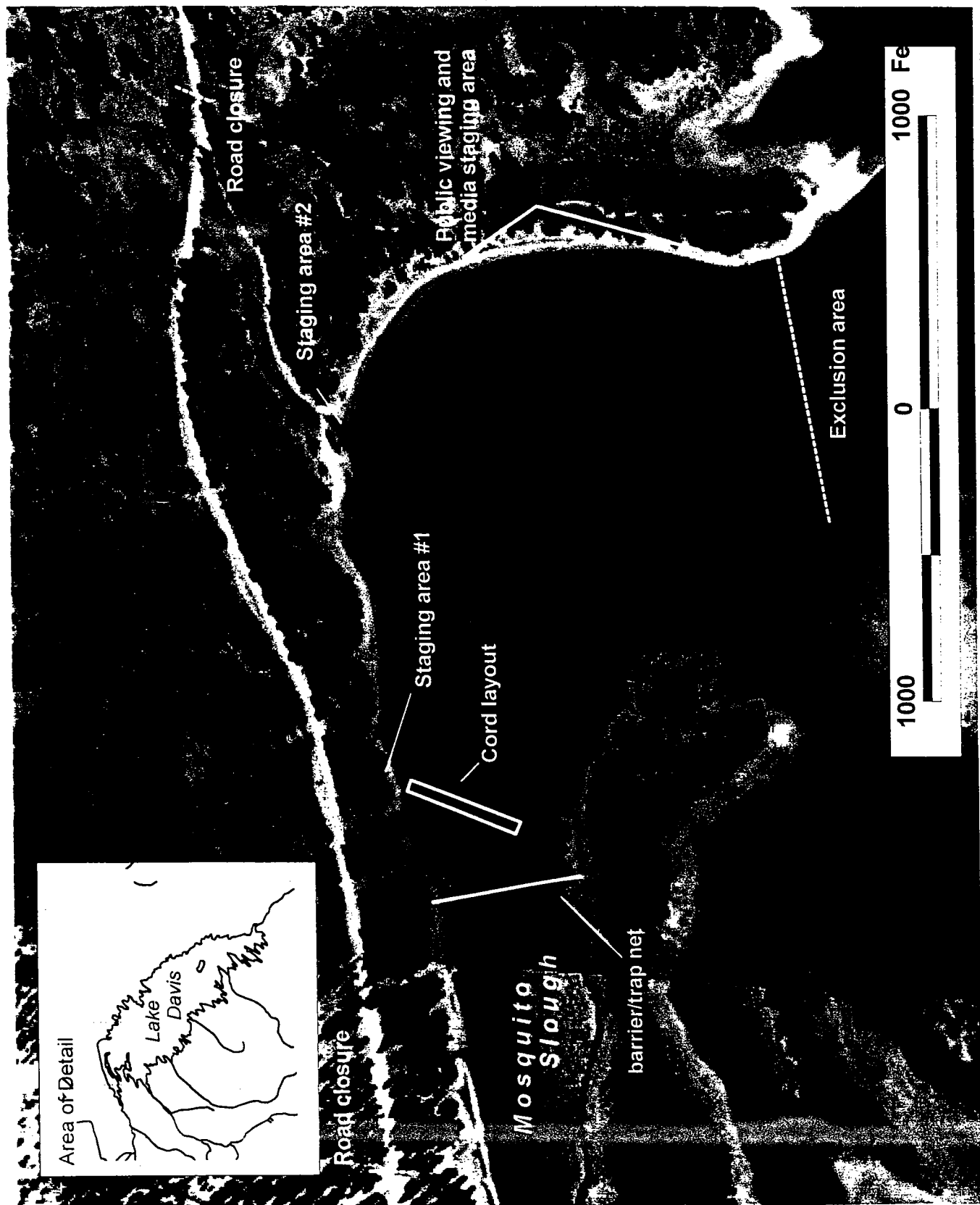


Figure 1. Lake Davis Detonation Cord Project, Phase I Project Area



Figure 2. Test of detonation cord in 1-acre area of Lake Davis.

FIGURE 3: DETONATION CORD LAYOUT, MOSQUITO SLOUGH, LAKE DAVIS

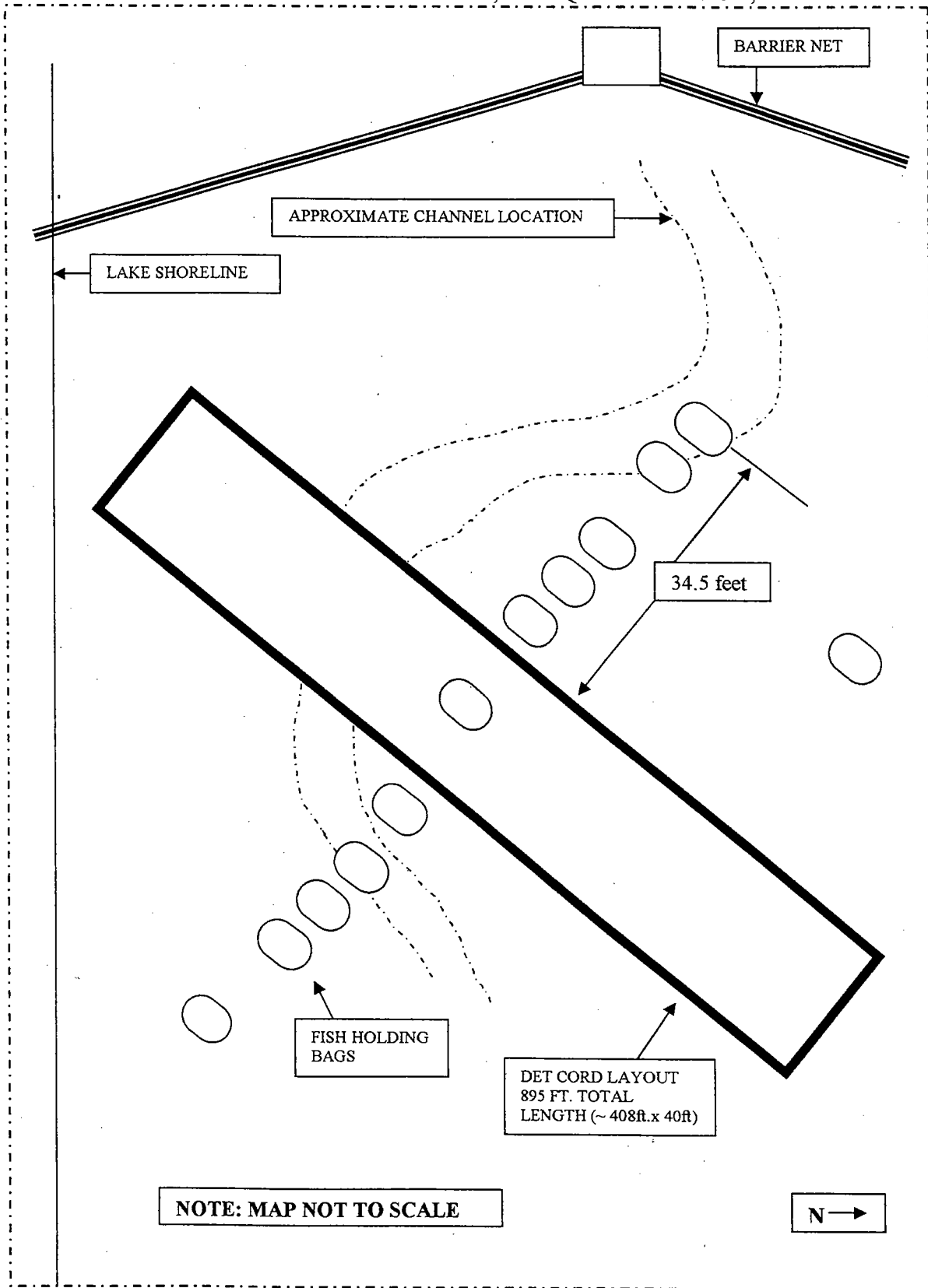


FIGURE 4

Sampling Locations
Lake Davis Detonation Project
April 24-25, 2002

